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BRIEFER ARTICLES.

INTRAMOLECULAR RESPIRATION.

THE experiment which is reported here failed in its original purpose, but the results which it did furnish seem to be worth reporting. The experiment was run in duplicate. Five grains of Japanese buckwheat, which had been previously soaked in distilled water for six hours, were placed in each of two eudiometers of 114^{cc} capacity. A piece of moist absorbent cotton was then placed loosely on the seeds, and the whole was secured in place by a cork with a groove in one side to admit of free circulation of the gases above and below. The volume of the seeds, cotton, and cork in the first eudiometer was 14.5^{cc}, and in the second 15.5^{cc}. The eudiometers were partly filled with mercury and inverted over a dish of the same metal. The column of mercury in no. 1 was 137^{mm}, and in no. 2 132^{mm} high. After reducing to standard pressure, no. 1 contained 65.41^{cc} and no. 2 contained 65.11^{cc} of atmospheric air.

The evolution of carbonic acid gas was quite rapid for the first few days. In forty-eight hours the volume of gases had increased so much that the column of mercury was entirely displaced and the gases had begun to escape through the dishes of mercury. This loss of gas seemed to invalidate the experiment, consequently the apparatus was set to one side until they could be again fitted up.

Some four weeks later it was decided to repeat the experiment with a smaller quantity of seeds; but before doing so 2^{cc} of strong caustic potash solution was introduced into each of the eudiometers to absorb any carbonic acid gas that might be present. An hour and ten minutes later it was found that the column of mercury in no. 1 had risen 215^{mm}, and in no. 2, 220^{mm} above the level of the dish, the temperature being 21° C. as at the beginning of the experiment. Thus, there was remaining in no. 1, after reducing to standard pressure, 32.49^{cc}, and in no. 2, 26.92^{cc} of gases. No. 1 contained, when the caustic potash solution was introduced, 99.5^{cc}, and no. 2, 98.5^{cc} of gases; hence no. 1 must have contained 67.01^{cc} of carbonic acid gas, of which, on the assumption that atmospheric air is 21 parts oxygen

and 79 parts nitrogen, 53.28°C was evolved by intramolecular respiration, and no. 2, 71.58°C , of which 57.91°C came from the same source.

If 0.21 of the atmospheric air in the eudiometer at the beginning of the experiment was oxygen, and 0.79 nitrogen, then no. 1 must have contained 51.67°C and no. 2 51.44°C of nitrogen. Now at the close of the experiment, assuming that no other gas was present, no. 1 contained 32.49°C and no. 2, 26.92°C nitrogen; therefore 19.18°C of nitrogen must have escaped from no. 1, and 24.52°C from no. 2. On the assumption that the gases were completely diffused, the nitrogen that escaped from the first eudiometer must have carried with it 26.65°C , and that from the second 38.62°C of carbonic acid gas. This shows that from the seeds in the first eudiometer 79.93°C , and in the second 96.53°C of carbonic acid gas must have been evolved by intramolecular respiration.

To explain this apparent discrepancy between the two results, it should be stated that germination had not proceeded so far in no. 1 as in no. 2; in the former the sprouts on the seeds were from 2 to 4^{mm} , and in the latter from 4 to 6^{mm} in length. Slight decomposition had taken place in both eudiometers, but no fungus was visible in either.—T. C. JOHNSON, *West Virginia University*.

NOTES ON *AQUILEGIA CANADENSIS* LINN. AND *A. VULGARIS* LINN.

FOR several years I have had growing in my dooryard a patch each of our common eastern columbine and of the European or garden species, and have found them a fruitful source of pleasure and study. I wish to record a few of the more interesting observations. When the buds develop in the axils of the leaves, they at first stand erect, but soon begin to droop, and by the time the flowers begin to expand they hang completely inverted. As soon as the pollen has been shed and the ovaries have been fertilized, the flowers begin gradually to resume the erect position, and by the time the outer whorls have fallen the five-parted ovaries are standing erect, ready to mature, dehisce, and scatter the seeds. This rapid change in the position of the flowers is made possible by the great and rapid changes in the length and thickness of the peduncles. At first they are about one-fourth inch long and very slender; by the time the flowers have fallen and the ovaries are standing erect the peduncles have grown to be three to five inches long, and are thick rigid stems. This entire change takes place in about five days.